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03

Landscape Management in the vicinity of Tangale Nature Reserve Area (upstream of Limboto-Bone Bolango Watershed), Gorontalo Province

AgFor Livelihood-Conservation Strategy - 03

Agroforestry and Forestry in Sulawesi (AgFor Sulawesi) - Environment Component

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May – 2016

World Agroforestry Centre
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Livelihood and Conservation Strategy - 03

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I. INTRODUCTION

1.1. Community Livelihoods and Environmental Conservation

Communities that reside around conservation areas, such as nature reserves, often rely on the natural resources in the vicinity for their livelihoods, while ignoring aspects of environmental conservation. However, environmental conservation is needed to address community pressure, overexploitation of the resources, prevent further environmental damage and ensure that these resources are utilized sustainably. Environmental conservation efforts often trigger conflict between communities and the conservation management agency. Communities tend to consider environmental conservation efforts as a threat to their sources of livelihood. Therefore, efforts to conserve natural resources should be carefully formulated and include livelihood aspects discussed and identified in participation with the local community involved.

Tangale Nature Reserve is located in Tibawa Sub-district, Gorontalo District, Gorontalo Province, Indonesia. It covers approximately 113 ha and is primarily a reserve for flora (250 species) and fauna conservation (Sunarti, *et al*., 2007; Rugayah, *et al*., 2009; Nurrani, 2013). However, encroachment on the reserve is unavoidable and causes serious degradation. Therefore, through the environmental component of the Agroforestry and Forestry (AgFor) Sulawesi Project, we have identified the need for environmental conservation efforts not only in the reserve, but also in the vicinity of the reserve, taking into account the livelihoods of the communities living in the area. AgFor Sulawesi is a five-year project that is working to address rural development challenges in Sulawesi by enhancing livelihoods and enterprises, improving governance and strengthening sustainable environmental management.

The environmental conservation efforts in the vicinity of Tangale Nature Reserve, covering a cluster of villages (Labanu, Mootilango, Iloponu, and Buhu), have been formulated into a Livelihood and Conservation Strategy (LCS). The aim of the strategy is to improve community livelihoods through environmental conservation principles leading to sustainable management of natural resources. This strategy will be used as a guideline for developing agreements between the government and local communities or multi stakeholder agreements and subsequent action plans for implementation.

1.2. The approach used to develop the Livelihood and Conservation Strategy

The overall framework for developing the Livelihood and Conservation Strategy follows the process ’from diagnosis (assessment) to action’ as presented in Figure 1. The diagnostic steps provide evidence of emerging issues the strategy should address. The assessments to identify issues preceding the strategy development covered aspects of land use change, biodiversity, water resources, farming systems, markets and analyses of Strengths, Weaknesses, Opportunities and Threats (SWOT) (Kow *et al*., 2015).

Further, a series of workshops to discuss identified issues were facilitated by AgFor project (Appendix 1), initiated by the formation of a working group that included relevant stakeholders (community representatives, village authorities, sub-district authorities, district government, and relevant government agencies and bodies) (Appendix 2). The working group held discussions on identified

issues relevant to community livelihoods and conservation and formulated a strategy to solve the identified issues.

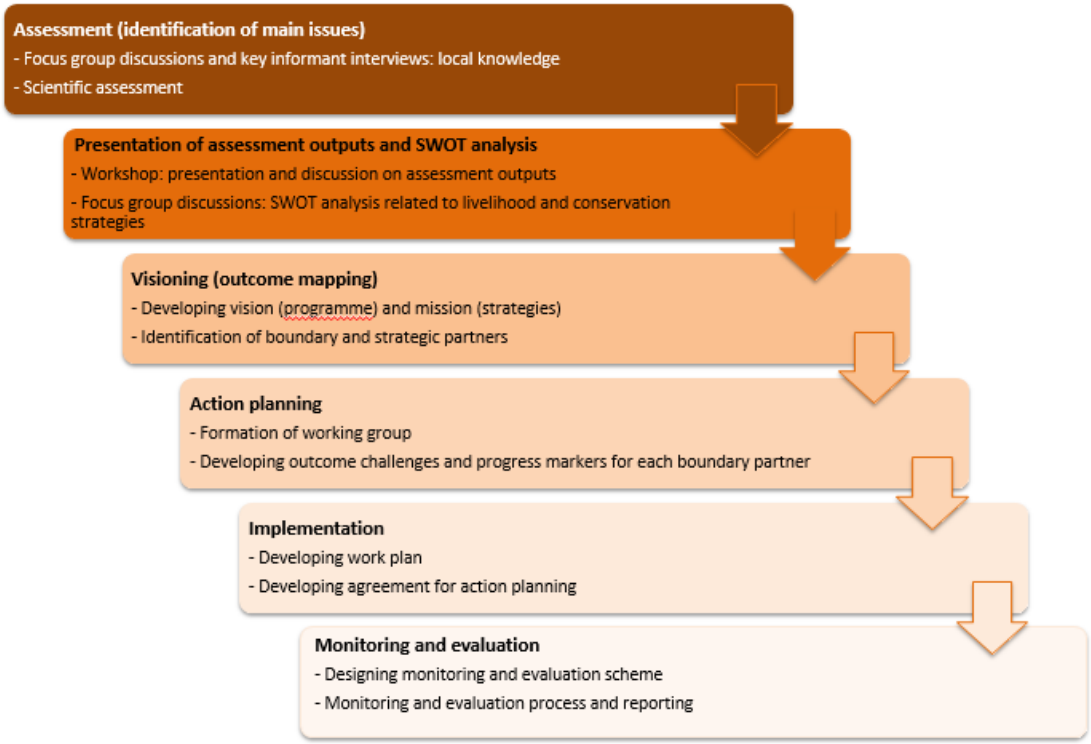


Figure 1. Approach to formulate the community livelihood and conservation strategy

In the development of this strategy, the Outcome Mapping Approach (Deprez, *et al*., 2010) was adopted to develop targeted programmes. The approach emphasizes the behavioural changes of partners or stakeholders involved in a programme. The stages in outcome mapping are: (1) development of vision and mission, (2) identification of boundary and strategic partners, (3) formulation of outcome challenges, and (4) formulation of progress markers. The last stage in formulation of the community livelihood and conservation strategy is periodical monitoring and evaluation following the implementation of a programme.

Details concerning the developed livelihood and conservation strategy and the action plan for implementation in the cluster villages in Tibawa Sub-district are presented in the following sub-chapters of this document. After the general description of Tangale Nature Reserve, community livelihood issues in the vicinity of Tangale Nature Reserve, and SWOT analysis are presented.

II. TANGALE NATURE RESERVE AND COMMUNITY LIVELIHOODS

2.1. Tangale Nature Reserve and neighbouring village cluster

Tangale Nature Reserve is a conservation area under the authority of the Natural Resource Conservation Agency (Balai Konservasi Sumber Daya Alam–BKSDA), Manado. However, the management is entrusted to the Bogani Nani Wartabone National Park Management (Balai Taman Nasional Bogani Nani Wartabone) (Sunarti, *et al*., 2007). Based on the Minister of Forestry Decree No.

431/Kpts/II/92, on the 5th of May 1999, Tangale Nature Reserve covers an area of 112.5 ha (Figure 2) and is reserved for flora and fauna conservation.

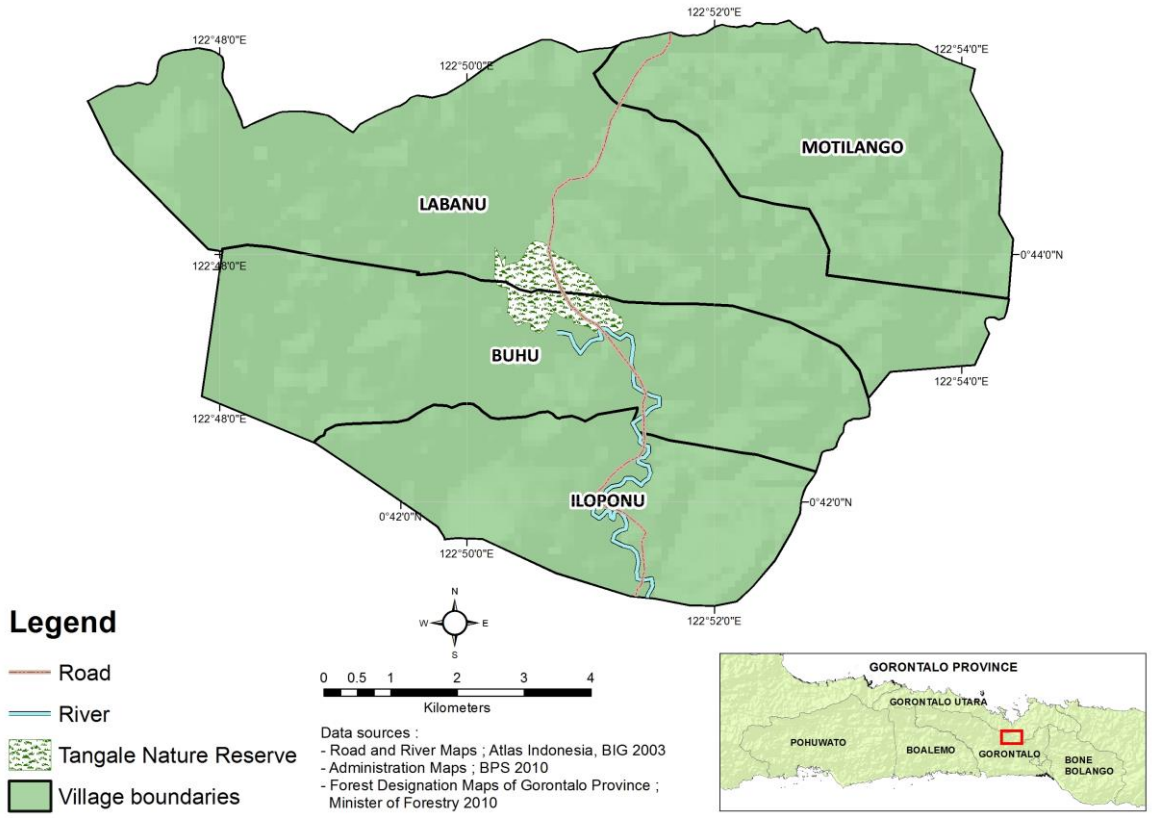


Figure 2. Location of Tangale Nature Reserve in Labanu Village, Tibawa Sub-district, Gorontalo District

Geographically, Tangale Nature Reserve lies between $0^{O}35' – 0^{O}$ 36' N and $122^{O}45' – 122^{O}47'$ E and is located at an altitude of between 100 and 350 metres above sea level with a relatively flat to slightly wavy topography. The average annual rainfall is 2390 mm with an average of 10 wet months and 2 dry months (Sunarti *et al*., 2007). Administratively, Tangale Nature Reserve is located in Labanu Village in Tibawa Sub-district, Gorontalo District, Gorontalo Province, Sulawesi and borders the trans-Sulawesi Road to the east and production forest to the northwest. This area is part of the Alo Sub-watershed or in the upstream area of Limboto-Bone Bolango Watershed (Figure 3).

Aside from Labanu Village (5 hamlets, 3533 ha), three other villages in the cluster: Buhu (8 hamlets, 1962 ha), Iloponu (5 hamlets, 2162 ha), and Mootilango, (6 hamlets, 3050 ha) (BPS Kab. Gorontalo, 2014), have become the focus of this study. Most of the cluster villages are located in the hills at an altitude of between 100-250 meters above sea level, with only a few below 100 m or between 250-500 meters. The topographic gradient of the villages is considered to be 'flat' (<8%), 'moderately steep' (16-25%), and 'steep' (26-40%), except Motilango. Most of Motilango is located in either flat or rather steep topography. Regarding the land tenure, most of the cluster villages are on private land with only a small portion of the villages located in Production Forest (HP) and Limited Production Forest (HPT).

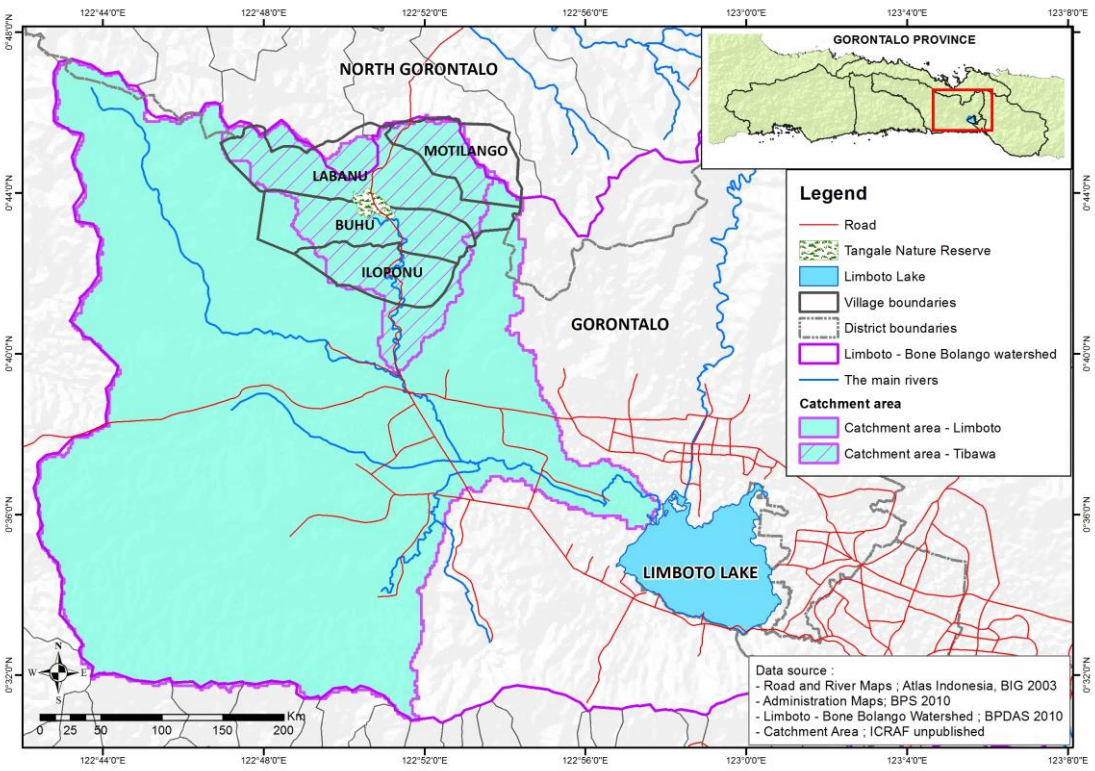


Figure 3. A cluster of villages in the vicinity of Tangale Nature Reserve

2.2. Community livelihoods in the vicinity of Tangale Nature Reserve

In 2014, the population of the village cluster was 11,533 people, 3181 families with almost equal men and women (BPS Kab. Gorontalo, 2014). The majority of the community work in the farming sector growing rice and vegetables as a side crop such as corn (*Zea mays*), soybean *(Glycine max),* peanut (*Arachis hypogaea*); and horticulture (onion/*Allium cepa*, pepper/*Piper nigrum*, and chilli/*Capsicum annuum*), and fruit (mango/*Mangifera indica*) and nut trees (candle nut/*Aleurites moluccana*) as their main commodities. They also raise some livestock such as cows, goats and chickens.

In Buhu, Mootilango, and Iloponu they also work as traders. The economic activities of the community are supported by the existence of some saving and loan institutions, agricultural commodity markets in Iloponu and Labanu, and various small-scale industries such as food, handicrafts, metal and weaving.

2.3. Issues related to livelihoods and conservation in the vicinity of Tangale Nature Reserve

In Tangale Nature Reserve, there are around 250 species of plant of these 72 species are used by the local communities for food (rice/cereal, tubes, fruit and vegetables), ornamental plants, herbal medicines and building materials (Sunarti, *et al*., 2007; Rugayah, *et al*., 2009; Nurrani, 2013).

Insufficient officers assigned to guard the reserve (Helma, 2014) and a huge an increase in the number of landless farmers, particularly in Mootilango (211 landless farmers out of 463 farmers) and Labanu (485 landless farmers out of 723 farmers) (Rahmah, 2014; PEMDES Mootilango, 2012) are considered the main triggers of encroachment on the Tangale Nature Reserve and forest area. This encroachment

is mostly in the form of illegal logging activities, rattan and bamboo harvesting for home industries, and growing coconut, teak and mahogany (Kow, *et al*., 2015; Rahmah, 2014; PEMDES Mootilango, 2012). These activities are causing the most degradation of the reserve and forest area.

Another pressing problem is the increase in area of degraded lands, landslides, floods (extreme wet seasons), drought (extreme dry seasons), and pests and diseases, which reduce the harvest and community income. Figure 4 shows the extent of land degradation: not degraded, minimally degraded, moderately degraded, degraded, and highly degraded in the four villages, including Tangale Nature Reserve.

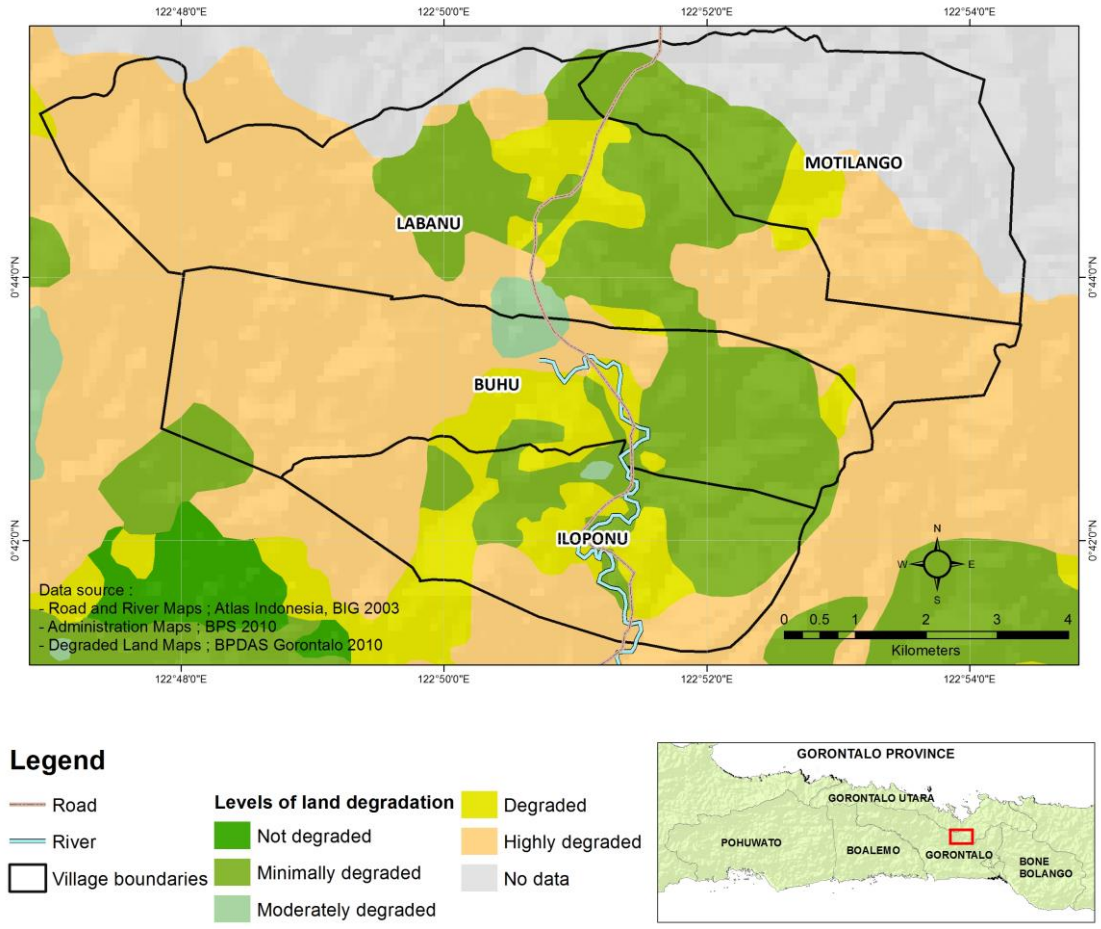
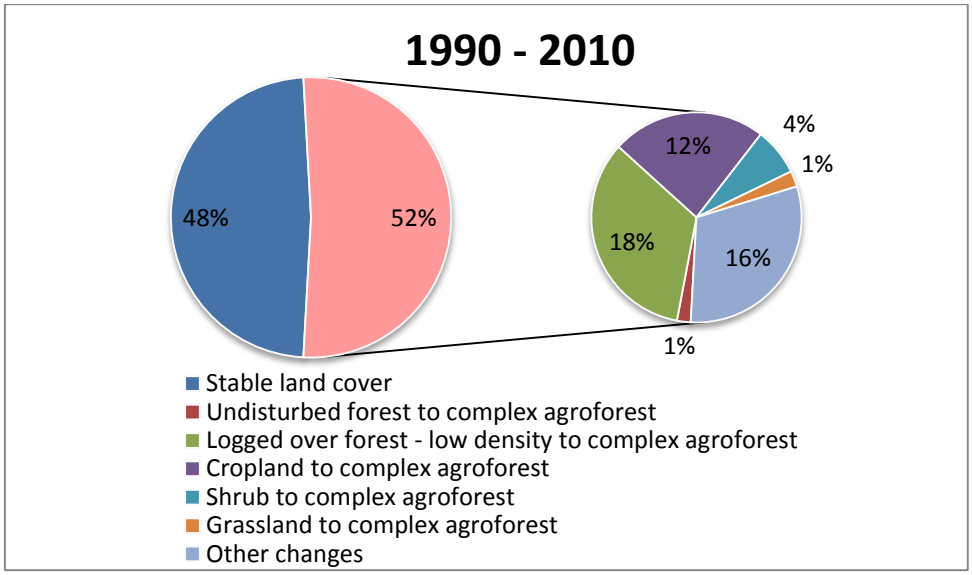


Figure 4. Varying degrees of land degradation in the village cluster

The increase and extent of degraded land in the four villages, located in the upstream area of Limboto-Bone Bolango Watershed (Alo Sub-watershed), has increased sedimentation in Lake Limboto located in the downstream area of Limboto-Bone Bolango Watershed (Figure 3). A study conducted by the Japan International Cooperation Agency (JICA) and Pusat Studi AMDAL, Samratulangi University found that the sedimentation in the 4 main rivers (Meluuopo, Alo-Pohu, Molalahu and Biyonga) flowing into Lake Limboto, is very high. The depth of the sediment in the East is between 3 and 5 meters, in the North between 5.8 and 6.4 meters, and in the South between 8.8 and 10.2 meters (Dako, 2015).

Based on the analysis of land use/cover changes over a 20-year period (1990-2010), 52% of the village cluster has experienced changes, mostly changing to complex agroforest (coconut, coffee, cocoa and clove). These changes mostly included secondary forest (18%) and annual crops (12%). In the period

from 2000 to 2005, the majority of land use change involved conversion of annual crops (26%) to complex agroforest (Figure 5). Drivers of land cover change in this area included the need to provide for the family, increase in a commodity price, and an increase in population.



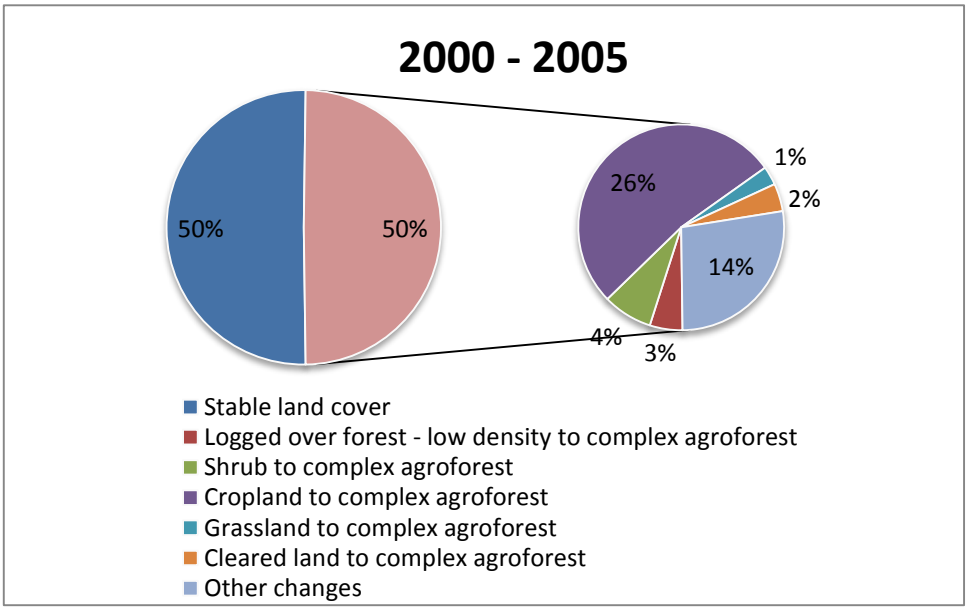


Figure 5. Dominant changes of land use and land cover

III. STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS (SWOT) ANALYSIS

SWOT analysis was conducted to explore community perceptions of the positive and negative things in the village cluster. This analysis was conducted as the basis for designing programmes and decision-making activities for the four villages (community tool box, 2015). The positive and negative internal conditions of the village cluster are the Strengths and Weaknesses, while the Opportunities and Threats are external positives and negatives.

The Strengths and Weaknesses were categorized in terms of five capitals: 1) natural, 2) human, 3) infrastructure/physical, 4) financial, and 5) social. We did not use categorization in the analysis of the Opportunities and Threats. The results were further used as a reference to find the main issues associated with Tangale Nature Reserve and to formulate and design the Conservation and Livelihood Strategy. The results of the analysis are presented in Table 1.

Based on Table 1, the main weaknesses and threats are connected to the increase and extent of degraded lands, illegal logging, and change in forest cover. While the opportunities that can provide future benefits for the village cluster communities are development of agricultural and agroforestry products and the utilization of degraded lands with support from strengths such as active village institutions and farmer groups.

Table 1. Summary of the SWOT Analysis for the village cluster around Tangale Nature Reserve

Capital	Strengths	Score	Weaknesses	Score
Natural Resource	Extensive high-quality forest	2	Increase in the extent of degraded land	3
	Extensive high-quality water resources (spring water and high quality river water	2	Decline in water quantity	2
	High value agricultural commodities (candle nut, coconut, clove and cocoa)	4		
	Potential for animal husbandry development	1		
Human resource	High level of educational attainment (high school, undergraduate)	2	Low level of educational attainment	2
	Diversified non-agricultural skills	2	Low level of agricultural knowledge	2
			High level of unemployment	2
			Limited proficiency in Indonesian (language)	1
Social	Well functioning village institutions (BPD, LPM)	4	Decline in traditional mutual assistance	3
	Active farmer groups (GAPOKTAN).	4		
Infrastructure	Adequate health facilities, schools and road infrastructure.	4	Poor quality roads in and between villages.	3
			Inadequate and distant market facilities	4

Capital	Strengths	Score	Weaknesses	Score
			Poor maintenance of public facilities (bathing, washing and latrine facilities; dams and schools)	2
Economy	Easy access to PNPM loans and saving facilities	2	Low commodity prices paid by middlemen	4
Threats		**Score**	**Opportunities**	**Score**
Illegal logging and forest conversion.		4	Development of further processing of agricultural commodities	4
High interest rates for loans		4	Increased utilization of underutilized and degraded lands	4
Sand mining activities		2		

IV. LIVELIHOOD AND CONSERVATION STRATEGY

The application of outcome mapping in developing the Livelihood and Conservation Strategy for Tibawa Village Cluster resulted in the formulation of the vision and mission, boundary and strategic partners, outcome challenges and progress markers as explained and described in detail in the following sections.

4.1. Vision and Mission

The vision statement describes why a programme is engaged in development and provides an inspirational focus. It reflects the large-scale development-related changes that the programme hopes to encourage. It describes environmental changes that the programme aims to help bring about, as well as broad behavioural changes in key boundary partners. Meanwhile, the mission statement describes how the programme intends to support the vision and the areas in which it will work towards the vision, but does not list all the activities in which it will engage (Deprez, et al., 2010).

Based on the outcome of our workshop, the vision statement of the village cluster in Tibawa Sub-district is: **"improve the livelihoods of the community around the forest area while maintaining the buffer capacity of the forest"**. In order to reach that vision, the main strategy reflected in the agreed mission is: **"conserve upstream areas and riverbank by planting species that can increase the local income"**.

4.2. Boundary Partners and Strategic Partners

In order to carry forward our strategy or mission (4.1), we needed to identify the stakeholders, individuals, institutions and/or groups that may potentially support our vision and mission either directly (boundary partners) or indirectly (strategic partners). The Boundary partners are those with whom the programme interacts directly and with whom any needed changes are agreed in order to contribute to the vision and mission. Meanwhile, strategic partners are those with a capacity and

resources to support the vision and mission (Deprez, et al., 2010). Several identified boundary partners included:

1. Forestry, Mining and Energy Agency at the district level (Dinas Kehutanan Pertambangan dan Energi – DisHutTambEn)
2. Extension implementation agency for farming, fishery, and forestry at the district level (Badan Pelaksana Penyuluhan Pertanian Perikanan dan Kehutanan – BP4K)
3. Watershed Management Agency (Balai Pengelolaan Daerah Aliran Sungai – BPDAS)
4. Farmers and Farmer Groups (Petani dan Kelompok Tani)
5. Village Governments (Pemerintah Desa)

In addition, several identified strategic partners included:

1. Non-Governmental Organizations (NGO)
2. Sub-district Government
3. Natural Resource Conservation Agency (Balai Konservasi Sumber Daya Alam – BKSDA)
4. Forest Management Agency (Kesatuan Pengelolaan Hutan – KPH)
5. Watershed Forum (Forum Daerah Aliran Sungai – DAS)

4.3. *Outcome Challenges*

The outcome challenges were a formulation of behavioural changes, actions, activities, and interactions needed and agreed by each boundary partner as their contribution towards the vision (Deprez, et al., 2010). The outcome challenges agreed in the workshop by each boundary partner, as part of the vision and mission of conserving degraded land in the upstream areas and on riverbank by planting seeds are presented in Table 2. The conservation of degraded land in the upstream areas and on riverbank by planting seeds that could also increase the local income.

The overall outcome challenges in Table 2 are that the community will plant seeds, provided by Watershed Management Agency or Forestry, Mining and Energy Agency, on degraded land in upstream areas and on riverbank with assistance from Extension Implementation Agency for Farming, Fishery, and Forestry in conservation and planting techniques. The Village Government will supervise the planting activities.

Table 2. Outcome challenges for each boundary partner

Boundary Partners	Outcome Challenges
Watershed Management Agency	The Watershed Management Agency will continually provide seeds that match the hydrological function of the watershed and have an economic value based on the results of discussions with the local community.
	The Watershed Management Agency will increase its role as a competent institution related to the conservation of riverbank and upstream areas.
Forestry, Mining and Energy Agency	The Forestry, Mining and Energy Agency will collaborate intensively with the Watershed Management Agency to provide seeds to be planted outside the forest area.

Boundary Partners	Outcome Challenges
Extension Implementation Agency for Farming, Fishery, and Forestry	The Extension Implementation Agency for Farming, Fishery, and Forestry will increase its role and function in conducting extension programmes and providing assistance and advice on conservation, planting and seedling techniques.
Farmers and Farmer Groups	Farmers will implement the planting patterns in line with conservation principles.
	The Farmer Groups will cooperate with each other and with related agencies.
Village Government	The Village Government will increase its monitoring function of farmer group activities for optimal implementation.
	The Village Government will increase its planning and regulatory function related to conservation activities.

4.4. *Progress Markers*

To attain the outcome challenges formulated in Table 3, a series of change processes is expected from each boundary partner, these processes are called progress markers. Our progress markers were arranged in three time periods: short-term, mid-term and long-term (Table 2).

Table 3. Progress markers for each boundary partner and outcome challenge

Partners	Outcome Challenges	Progress Markers		
		Short-term	Mid-term	Long-term
Watershed Management Agency	The Watershed Management Agency will continually provide seeds that match the hydrological function of the watershed and have an economic value based on the results of discussions with the local community.	The Watershed Management Agency will conduct studies and comprehensive discussions on suitable plants to support economic needs and conservation functions	The Watershed Management Agency will provide seeds that suit community needs	The Watershed Management Agency will periodically provide seeds that suit community needs
	The Watershed Management Agency will increase its role as a competent institution related to the conservation of	The Watershed Management Agency will provide updates on the watershed condition	The Watershed Management Agency will periodically inform the community at the village level of	The Watershed Management Agency will conduct studies on the success of conservation efforts and communicate

Partners	Outcome Challenges	Progress Markers		
		Short-term	Mid-term	Long-term
	riverbank and upstream areas.		the watershed condition	the results to the community
Forestry, Mining and Energy Agency	The Forestry, Mining and Energy Agency will collaborate intensively with the Watershed Management Agency to provide seeds to be planted outside the forest area.	The Forestry, Mining and Energy Agency will initiate collaboration with the Watershed Management Agency	The Forestry, Mining and Energy Agency will collaborate with the Watershed Management Agency to see that all activities are sustainably implemented	The Forestry, Mining and Energy Agency will collaborate with the Watershed Management Agency to provide seeds that suit the economic needs of the community and conservation purposes and see that all activities are sustainably implemented
Extension Implementation Agency for Farming, Fishery, and Forestry	The Extension Implementation Agency for Farming, Fishery, and Forestry will increase its role and function in conducting extension programmes and providing assistance and advice on conservation, planting and seedling techniques.	The Extension Implementation Agency for Farming, Fishery, and Forestry will develop extension materials that suit community needs in the form of leaflets, etc.	The Extension Implementation Agency for Farming, Fishery, and Forestry will periodically provide technical assistance	The Extension Implementation Agency for Farming, Fishery, and Forestry will evaluate the implementation of technical assistance programmes and communicate the results to the community
Farmers and farmers groups	Farmers will implement the planting patterns in line with conservation principles.	Farmers will attend meetings on planting patterns with regard to conservation principles	Farmers will actively participate in training on planting patterns with regard to conservation principles	Farmers will change their mind set on planting systems by implementing planting patterns in line with conservation principles
	The Farmer Groups will cooperate with each other and with related agencies.	The farmer groups will be reactivated	Farmer groups will periodically conduct and coordinate	Farmer groups will communicate regularly with each

Partners	Outcome Challenges	Progress Markers		
		Short-term	Mid-term	Long-term
			meetings related to conservation activities	other and related agencies
	The village government will increase its monitoring function of farmer group activities for optimal implementation.	The village government will coordinate with related agencies and develop a monitoring schedule for conservation activities	The village government will coordinate with extension agencies to review the success of conservation activities	The village government will incorporate conservation monitoring activities into the village work plan (RKPDES).
Village government	The Village Government will increase its planning and regulatory function related to conservation activities.	The Village Government will conduct studies to decide whether a regulation related to riverbank and degraded land conservation should be issued in the form of a village regulation (PERDES)	The Village Government will follow the process of issuing village regulations related to riverbank and degraded land conservation	The Village Government will issue village regulations related to riverbank and degraded land conservation

V. FOLLOW UP FOR IMPLEMENTATION

To implement the agreed strategy or mission (conservation of upstream and riverbank areas with economically valuable plants), several steps are needed to assist the working group in developing an action plan. The initial step is to identify an area that will become the pilot site for a plantation and identify the local community's preferences for tree species. We determined the potential planting sites and tree preferences by analysing the spatial data (maps), conducting surveys of potential planting sites, and discussing these with the community and working group members.

5.1. Determining the potential planting sites

Before determining the potential planting sites we started with an initial survey with the local community and representatives of the Watershed Management Agency to gain a general description of the areas that need to be conserved using technical and/or vegetative conservation methods. In this initial survey, we identified seven potential planting sites, mostly riverbank, which mainly needed technical conservation (construction of gabions). From the initial survey results and discussions with

community representatives, we developed several criteria for potential planting sites based on spatial data (maps) and community perceptions (Table 4).

Table 4. Criteria for potential planting sites

Source of information	Location criteria	Level of priority for planting sites		
		Priority 1	Priority 2	No Priority
Land typology	Forest area	Other purpose areas (APL), production forest (HP), convertible production forest (HPK), limited production forest (HPT)	Other purpose areas (APL), production forest (HP), convertible production forest (HPK), limited production forest (HPT)	Conservation areas (nature reserve, wildlife reserve, national park)
	Levels of land degradation	Highly degraded, degraded	Moderately degraded, minimally degraded	Not degraded
	Land cover	Cleared land, annual crops, monoculture, upland rice fields, shrubs, settlements	Cleared land, annual crops, monoculture, upland rice fields, shrubs, settlements	Forest, agroforest, water bodies
Community perception	Land cover	No annual crop, cleared land	No annual crop, cleared land	Productive plants
	Level of production	Low	Low	Medium-high
	Location	Riverbank, steep land near settlements	Riverbank, steep land near settlements	Other than riverbank, away from settlements

Overall, the process of determining potential planting sites was conducted in five stages as summarized in Figure 6, namely: (1) development of a land typology, (2) discussions with the local community on their perceptions related to the criteria and prioritisation of potential planting sites, (3) selection of potential planting sites, (4) survey of potential planting sites, and (5) choose the planting sites.

1. Development of land typology and priority order of potential planting sites

Land typology was used to classify land characteristics by overlaying three spatial data maps: forestland designation (KLHK Republik Indonesia, 2010), land degradation (BPDAS Bone Bolango, 2010), and land cover. The overlay of these 3 maps provided information on land status (forest or non-forest areas), levels of land degradation, and types of land cover. This information was then used to select the potential planting sites (Step 3) and to prioritise the potential planting sites (Table 4).

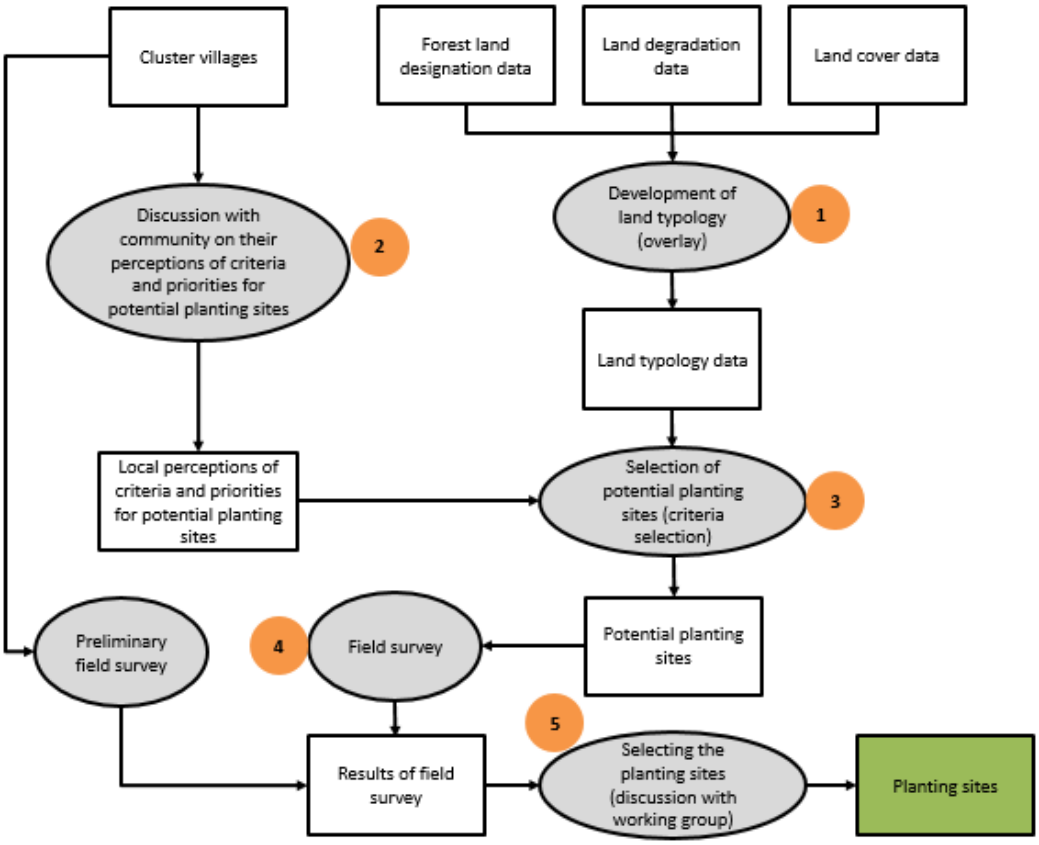


Figure 6. Flow Chart for determining the planting sites

2. Criteria and priority of potential planting sites based on community perceptions

In collaboration with representatives of the working group and community groups, we held discussions to identify the local communities' perceptions of the criteria for selecting the potential planting sites. The criteria the community used included the level of production, type of land cover and location (Table 4). These criteria were then used to select the potential planting sites (Step 3) and to prioritise the potential planting sites.

3. Selection of potential planting sites based on the developed criteria

Selection of potential planting sites resulted in a total of 27 sites consisting of: 7 sites from the preliminary survey, 10 sites based on the land typology, and 10 sites based on the community's perceptions (Figure 7 and Appendix 3).

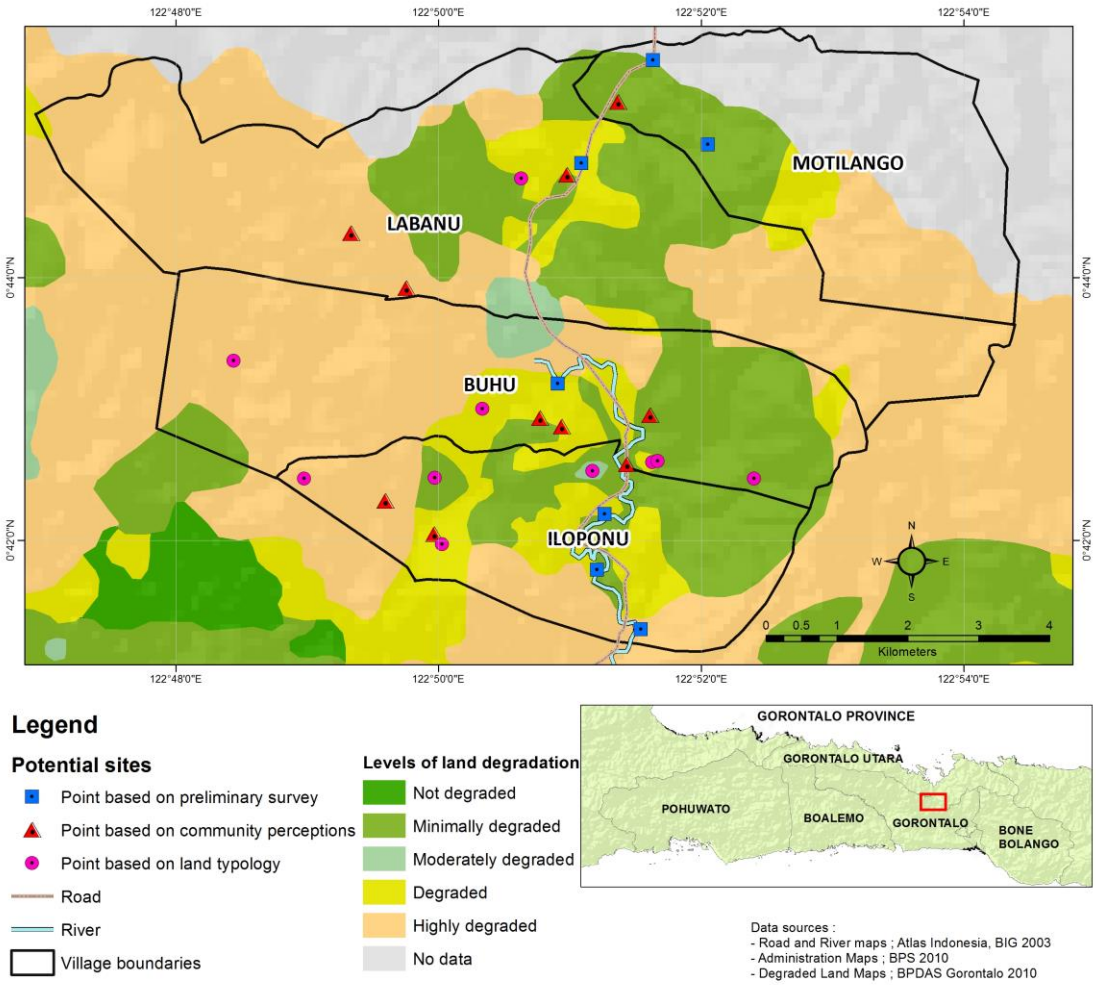


Figure 7. Potential planting sites based on the initial survey, community perceptions and land typology map

4. Survey of potential planting sites

A survey of the potential planting sites provided a description of the land conditions, taking into account the results of preliminary survey and selection of potential planting sites based on the criteria (Step 3). This included land covers, canopy density, topography, land area and site accessibility (Table 5).

5. Selecting the planting sites

Selecting the planting sites was the final stage in the planting site selection using the identified criteria (Step 3) and field survey (Step 4). Out of these 27 potential planting sites, there were 9 selected sites in Buhu, Labanu, and Mootilango villages (Figure 8). Although these sites have been appointed, further discussion at the level of the working group and community group, related to land tenure, is still required.

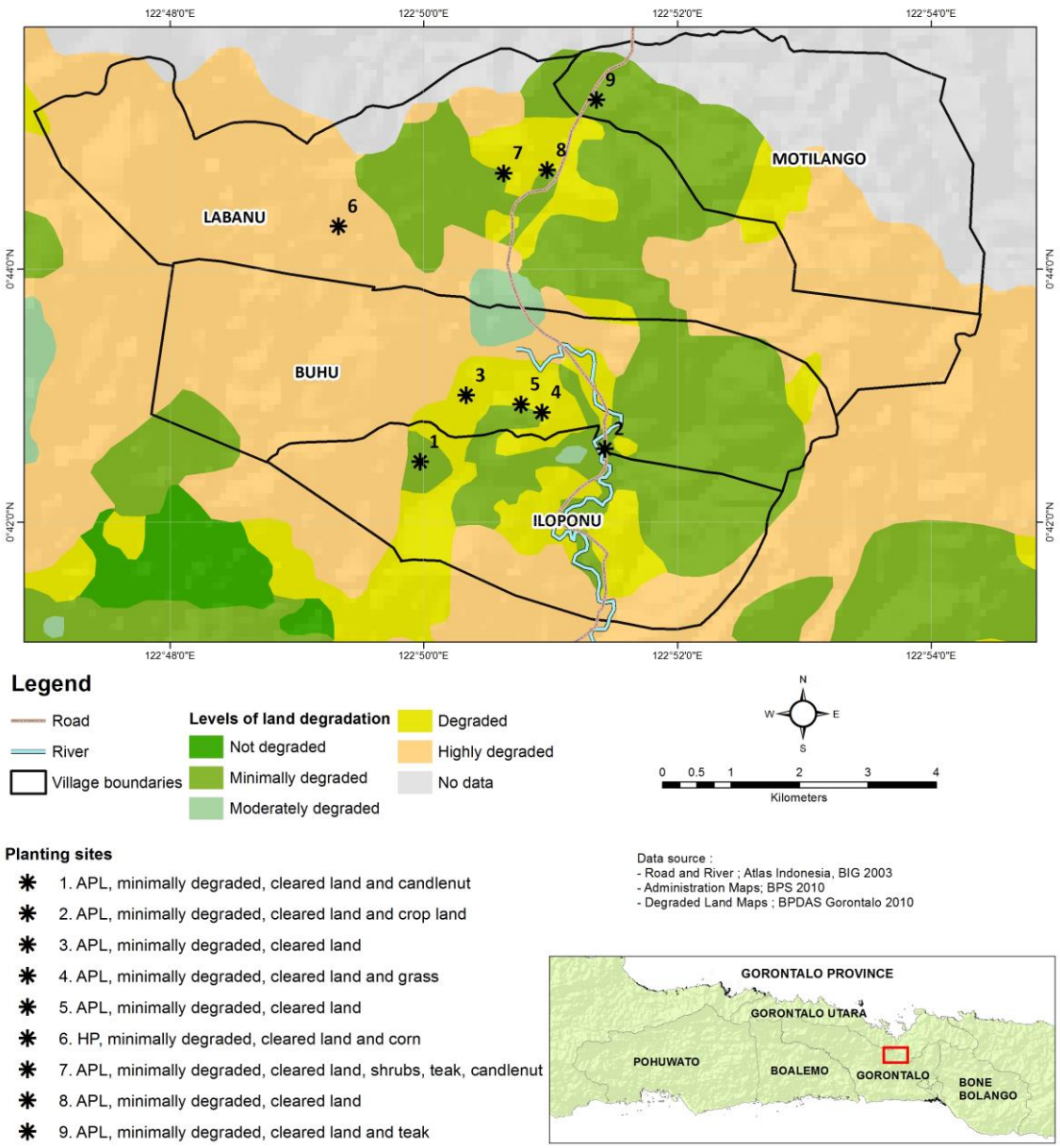


Figure 8. Nine selected planting sites

Table 5. Survey criteria and the potential planting sites

Survey criteria	Potential of the potential planting sites	
	Potential	**No potential**
Land cover	Cleared land, annual crop, monoculture, upland rice fields, settlement, shrubs	Forest, agroforest, water body
Canopy Density	Low (≤ 40%)	Medium - high (> 40%)
Topography	Hills	Flat, slopes
Land area	≥ 2 hectare	≤ 2 hectare
Accessibility	Accessible	Inaccessible

5.2. Tree Species Preferences

The tree species preferences were identified during discussions at the village level and in the workshops at the district level. From these discussions, the community selected several types of tree such as timber trees (Teak/*Tectona grandis, Palaquium sp,* jabon*/Anthocephalus cadamba,* pine*/Pinus merkusii*), fruit trees (jack fruit/*Artocarpus heterophyllus*), and nuts trees (nutmeg/*Myristica fragrans* and candle nut/*Aleurites moluccana*). Bamboo was a specific species mentioned for riverbank conservation.

VI. CLOSING

The livelihood and conservation strategy developed for the Tibawa Village Cluster has produced visions, missions and outcome challenges for the boundary and strategic partners. This led to the identification of 9 potential planting sites and 8 preferred species to be planted. This strategy and potential planting sites will be used to develop commitment and/or multi stakeholder agreements for tree planting programmes and land conservation practices.

The follow up at the community/farmer level needs to include: a series of socialization activities, capacity strengthening, assistance, and the establishment of a local institution, mainstreaming it with government programmes and other activities.

This livelihood and conservation strategy is expected to be the starting point for improving community livelihoods through sustainable utilization of natural resources that follow environmental conservation principles. This would subsequently minimise environmental impacts on the Tangale Nature Reserve located in the Alo sub-watershed or the upstream area of the Limboto-Bone Bolango watershed.

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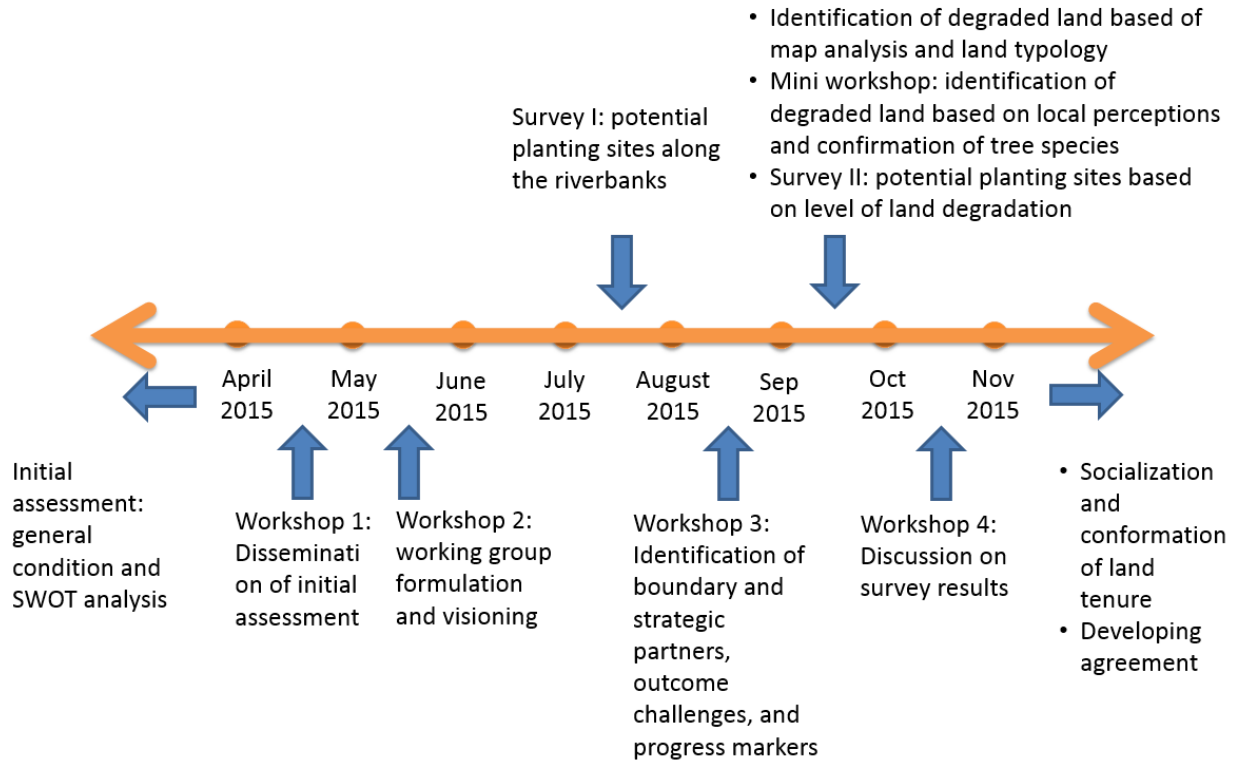
APPENDICES

Appendix 1. Series of workshops for strategy formulation



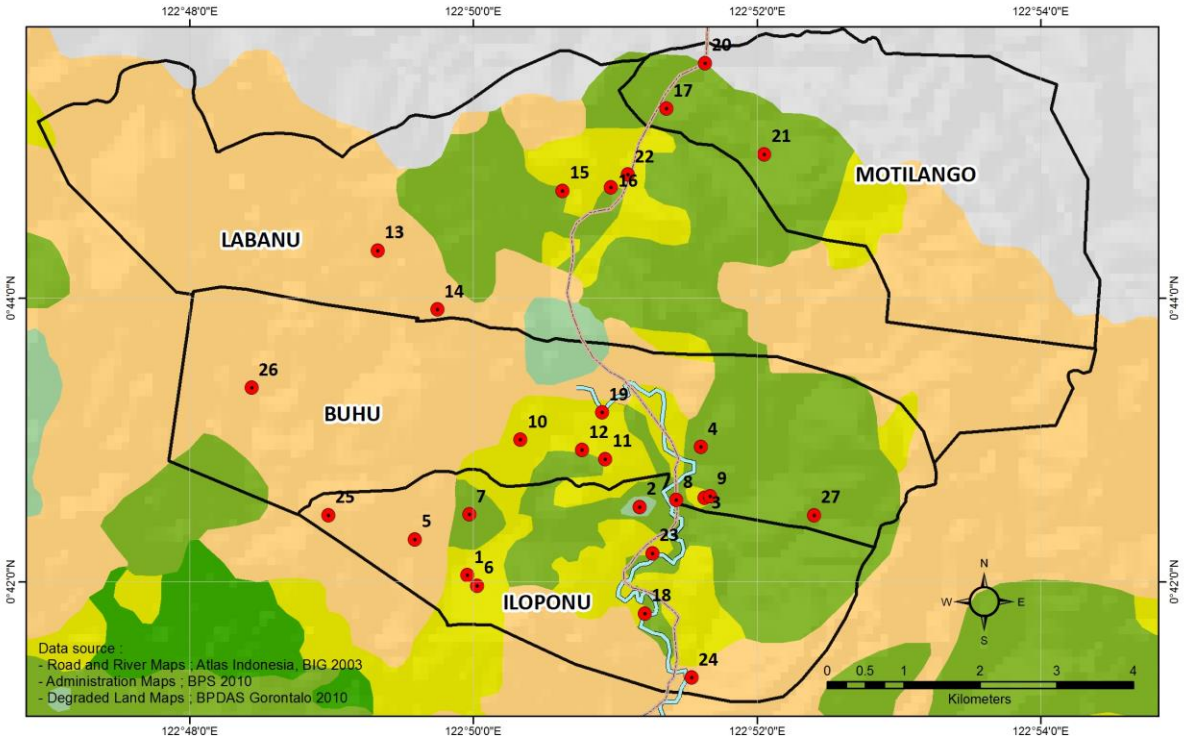
Appendix 2. Members of the working group

Coordinator: Head of Development Planning Agency of Gorontalo District

Members:

- Dr. Iswan Dunggio, M. Si (Forestry, Mining and Energy Agency)
- Denny L. Rambing (Extension Implementation Agency for Farming, Fishery, and Forestry)
- Herlina Saleh (Agriculture and Plantation Agency)
- Rahman Gobel (Watershed Management Agency)
- Yunus Dunggio (head of Iloponu village)
- Wirawan Lamalani (head of Buhu village)
- Fadly Otuhu (head of Labanu village)
- Ishak Buna (head of Motilango village)
- Fatni Yunus (coordiantor of Iloponu farmer group)
- Pery Ismail (coordiantor of Buhu farmer group)
- Yusuf Saleh (coordiantor of Iloponu farmer group)
- Ramsi Toyili (coordiantor of Mootilango farmer group)
- Sugeng Sutrisno (local NGO (JAPESDA))
- Hastuty Ajub, S. Hut (Forest Management Unit)
- Rahmat Biki (Natural Resources Conservation Agency)
- Hasna Adipu (Tibawa Sub-district government)
- Dr. Irwan Bempah, M. Si (Gorontalo Watershed Forum)

Appendix 3. Selection of 27 potential planting sites based on land typology data (10), community perceptions (10) and initial survey (7)



Legend

- Road
- River
- Village boundaries

Levels of land degradation

- Not degraded
- Minimally degraded
- Moderately degraded
- Degraded
- Highly degraded
- No data

Survey Location Points

1. APL, degraded, monoculture
2. APL, minimally degraded, settlement
3. APL, minimally degraded, rice field
4. APL, minimally degraded, agroforest
5. APL, highly degraded, forest
6. APL, degraded, monoculture
7. APL, minimally degraded, cleared land
8. APL, minimally degraded, cleared land
9. APL, minimally degraded, rice field
10. APL, degraded, cleared land
11. APL, degraded, cleared land
12. APL, degraded, cleared land
13. HP, highly degraded, cleared land
14. APL, highly degraded, agroforest
15. APL, degraded, cleared land
16. APL, minimally degraded, cleared land
17. APL, minimally degraded, cleared land
18. APL, minimally degraded, settlement
19. APL, degraded, agroforest
20. APL, minimally degraded, settlement
21. APL, minimally degraded, forest
22. APL, degraded, agroforest
23. APL, degraded, forest
24. APL, highly degraded, settlement
25. APL, highly degraded, monoculture
26. APL, highly degraded, monoculture
27. APL, minimally degraded, monoculture

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